

PTO/SB/21 (08-00)

Approved for use through 10/31/2002. OMB 0651-0031

U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

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TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

Application Number 10/646,247

Filing Date 08/22/2003

First Named Inventor S. S. P. Parkin

Group Art Unit 2811

Examiner Name to be assigned

Total Number of Pages in This Submission

Attorney Docket Number ARC920030071US1

ENCLOSURES (check all that apply)

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| <input checked="" type="checkbox"/> Fee Transmittal Form | <input type="checkbox"/> Assignment Papers (for an Application) | <input type="checkbox"/> After Allowance Communication to Group |
| <input type="checkbox"/> Fee Attached | <input type="checkbox"/> Drawing(s) | <input type="checkbox"/> Appeal Communication to Board of Appeals and Interferences |
| <input type="checkbox"/> Amendment / Reply | <input type="checkbox"/> Licensing-related Papers | <input type="checkbox"/> Appeal Communication to Group (Appeal Notice, Brief, Reply Brief) |
| <input type="checkbox"/> After Final | <input type="checkbox"/> Petition | <input type="checkbox"/> Proprietary Information |
| <input type="checkbox"/> Affidavits/declaration(s) | <input type="checkbox"/> Petition to Convert to a Provisional Application | <input type="checkbox"/> Status Letter |
| <input type="checkbox"/> Extension of Time Request | <input type="checkbox"/> Power of Attorney, Revocation Change of Correspondence Address | <input type="checkbox"/> Other Enclosure(s) (please identify below): |
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| <input type="checkbox"/> Certified Copy of Priority Document(s) | <input type="checkbox"/> CD, Number of CD(s) _____ | |
| <input type="checkbox"/> Response to Missing Parts/ Incomplete Application | Remarks | |
| <input type="checkbox"/> Response to Missing Parts under 37 CFR 1.52 or 1.53 | | |

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm
or
Individual name

Daniel E. Johnson

Signature

Date

04/14/2004

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O.Box 1450, Alexandria, VA 22313-1450 on this date:

04/14/2004

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Cheryl G. Ruby

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4/14/04

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PTO/SB/17 (10-01)

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FEE TRANSMITTAL for FY 2002

Patent fees are subject to annual revision.

TOTAL AMOUNT OF PAYMENT (\$) 0.00

Complete if Known

Application Number	10/646,247
Filing Date	08/22/2003
First Named Inventor	S. S. P. Parkin
Examiner Name	to be assigned
Group Art Unit	2811
Attorney Docket No.	ARC920030071US1

METHOD OF PAYMENT

- 1.
- ☒
- The Commissioner is hereby authorized to charge indicated fees and credit any overpayments to:

Deposit Account Number	09-0441
Deposit Account Name	IBM CORPORATION

☒ Charge Any Additional Fee Required Under 37 CFR 1.16 and 1.17☐ Applicant claims small entity status. See 37 CFR 1.27

- 2.
- ☐
- Payment Enclosed:

☐ Check ☐ Credit card ☐ Money Order ☐ Other**FEE CALCULATION****1. BASIC FILING FEE**

Large Entity Small Entity

Fee Code	Fee (\$)	Fee Code	Fee (\$)	Fee Description	Fee Paid
101	740	201	370	Utility filing fee	
106	330	206	165	Design filing fee	
107	510	207	255	Plant filing fee	
108	740	208	370	Reissue filing fee	
114	160	214	80	Provisional filing fee	

SUBTOTAL (1) (\$) 0.00

2. EXTRA CLAIM FEES

Total Claims	Extra Claims	Fee from below	Fee Paid
Independent Claims	-20** =	18.00	0.00
Multiple Dependent	-3** =	84.00	0.00

Large Entity Small Entity

Fee Code	Fee (\$)	Fee Code	Fee (\$)	Fee Description
103	18	203	9	Claims in excess of 20
102	84	202	42	Independent claims in excess of 3
104	280	204	140	Multiple dependent claim, if not paid
109	84	209	42	** Reissue independent claims over original patent
110	18	210	9	** Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) (\$) 0.00

**or number previously paid, if greater; For Reissues, see above

FEE CALCULATION (continued)**3. ADDITIONAL FEES**

Large Entity Fee Code	Large Entity Fee (\$)	Small Entity Fee Code	Small Entity Fee (\$)	Fee Description	Fee Paid
105	130	205	65	Surcharge - late filing fee or oath	
127	50	227	25	Surcharge - late provisional filing fee or cover sheet	
139	130	139	130	Non-English specification	
147	2,520	147	2,520	For filing a request for ex parte reexamination	
112	920*	112	920*	Requesting publication of SIR prior to Examiner action	
113	1,840*	113	1,840*	Requesting publication of SIR after Examiner action	
115	110	215	55	Extension for reply within first month	
116	400	216	200	Extension for reply within second month	
117	920	217	460	Extension for reply within third month	
118	1,440	218	720	Extension for reply within fourth month	
128	1,960	228	980	Extension for reply within fifth month	
119	320	219	160	Notice of Appeal	
120	320	220	160	Filing a brief in support of an appeal	
121	280	221	140	Request for oral hearing	
138	1,510	138	1,510	Petition to institute a public use proceeding	
140	110	240	55	Petition to revive - unavoidable	
141	1,280	241	640	Petition to revive - unintentional	
142	1,280	242	640	Utility issue fee (or reissue)	
143	460	243	230	Design issue fee	
144	620	244	310	Plant issue fee	
122	130	122	130	Petitions to the Commissioner	
123	50	123	50	Processing fee under 37 CFR 1.17(q)	
126	180	126	180	Submission of Information Disclosure Stmt	
581	40	581	40	Recording each patent assignment per property (times number of properties)	
146	740	246	370	Filing a submission after final rejection (37 CFR § 1.129(a))	
149	740	249	370	For each additional invention to be examined (37 CFR § 1:129(b))	
179	740	279	370	Request for Continued Examination (RCE)	
169	900	169	900	Request for expedited examination of a design application	

Other fee (specify)

*Reduced by Basic Filing Fee Paid

SUBTOTAL (3) (\$) 0.00

SUBMITTED BY

Name (Print/Type)	Daniel E. Johnson	Registration No. (Attorney/Agent)	37,033	Telephone	408-927-3367
Signature				Date	04/14/2004

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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of : April 14, 2004
S Parkin : Group Art Unit: 2811
Serial No.: 10/646,247 : Examiner: Unknown
Filed: August 22 , 2003 : San Jose, California
Title: MgO-based tunnel spin injectors

INFORMATION DISCLOSURE STATEMENT

Commissioner for Patents
U.S. Patent and Trademark Office
P. O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

Under the provisions of 37 CFR § 1.97 through §1.99 and pursuant to Applicant's duty of disclosure under 37 CFR §1.56, Applicant respectfully brings the following document(s) listed on the attached form PTO-1449 to the attention of the Examiner in charge of the above-identified application. Copies of the listed document(s) are provided herewith.

This Information Disclosure Statement is being submitted before receiving a first Office Action on the merits for the above-identified patent application. (No fee is due.)

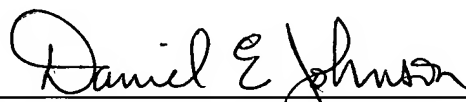
This submission does not constitute an admission that the cited reference(s) are relevant or material to the claims. The reference(s) are only cited as constituting related art of which Applicant is aware.

It is respectfully requested that the listed references be considered by the Examiner and formally made of record in this application.

The Director is hereby authorized to charge payment of any deficiency in the above fee(s) or to charge any additional fees required under 37 CFR § 1.16 or 1.17 or credit any overpayment to Deposit Account No. 09-0441. A duplicate copy of this authorization is attached for the Finance Branch.

Respectfully submitted,

S. Parkin

By 
Daniel E. Johnson (#37,033)
Agent for Applicant
Phone (408) 927-3367

DEJ:cgr

Attachments

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Substitute for form 1449A/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT (use as many sheets as necessary)				Application Number	10/646,247
				Filing Date	August 22, 2003
				First Named Inventor	S. Parkin
				Art Unit	2811
				Examiner Name	Unassigned
Sheet	2	of	5	Attorney Docket Number	ARC920030071US1

U.S. PATENT DOCUMENTS					
Examiner Initials [*]	Cite No. ¹	Document Number	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number - Kind Code ² (if known)			
		US- 2002/0114112 A1	08-22-2002	Nakashio et al.	
		US- 2002/0159203 A1	10-31-2002	Saito et al.	
		US- 2002-0163764 A1	11-07-2002	Nakazawa et al.	
		US- 2002/0164828 A1	11-07-2002	Ishiwata et al.	
		US- 2002/0191355 A1	12-19-2002	Hiramoto et al.	
		US- 2003/0035249 A1	02-20-2003	Ho et al.	
		US- 2003/0058685 A1	03-27-2003	Tran et al.	
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FOREIGN PATENT DOCUMENTS						
Examiner Initials [*]	Cite No. ¹	Foreign Patent Document	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T ⁶
		Country Code ³ - Number ⁴ - Kind Code ⁵ (if known)				
		JP 2000 322714	24-Nov-2000	Teruaki et al.	Abstract	

Examiner Signature		Date Considered	
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^{*}EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

¹ Applicant's unique citation designation number (optional). ² See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. ³ Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). ⁴ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁵ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST. 16 if possible. ⁶ Applicant is to place a check mark here if English language Translation is attached.

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (use as many sheets as necessary)		Application Number	10/646,247
		Filing Date	August 22, 2003
		First Named Inventor	S. Parkin
		Group Art Unit	2811
		Examiner Name	Unassigned
Sheet 3 of 5	Attorney Docket Number	ARC920030071US1	

OTHER PRIOR ART -- NON PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No. ¹	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T ²
		M. Julliere, "Tunneling Between Ferromagnetic Films", Physics Letters, Vol. 54A, Number 3, September 8, 1975, pp. 225-226.	
		R. Meserve et al., "Spin-Polarized Electron Tunneling", Physics Reports (Review Section of Physics Letters) Vol. 238, No. 4, 1994, pp. 173-243.	
		J. S. Moodera et al., "Large Magnetoresistance at Room Temperature in Ferromagnetic Thin Film Tunnel Junctions", Physical Review Letters, Vol. 74, No. 16, April 17, 1995, pp. 3273-3276.	
		T. Miyazaki et al., "Giant magnetic tunneling effect in Fe/A12O3/Fe junction", Journal of Magnetism and Magnetic Materials, Vol. 139, 1995, pp. L231-L234.	
		D. J. Keavney et al., "Perpendicular conductance and magnetic coupling in epitaxial Fe/MgO/Fe(100) trilayers", J. Appl. Phys., Vol. 81, No. 2, January 15, 1997, pp. 795-798.	
		P. K. Wong et al., "High conductance magnetoresistive tunnel junctions with multiply oxidized barrier", Journal of Applied Physics, Vol. 83, No. 11, June 1, 1998, pp. 6697-6699.	
		E. Y. Tsymbal et al., "Spin-polarized electron tunneling across a disordered insulator", Physical Review B, Vol. 58, No. 1, July 1, 1998-I, pp. 432-437.	
		S.S.P. Parkin et al., "Exchange-biased magnetic tunnel junctions and application to nonvolatile magnetic random access memory (invited)", J. of Applied Physics, Vol. 85, No. 8, April 15, 1999, pp. 5828-5833.	
		K. Aoshima et al., "Thermal deterioration mechanism of CoFeB/PdPtMn Spin valves", J. of Applied Physics, Vol. 85, No. 8, April 15, 1999, pp. 5042-5044.	
		Ph. Mavropoulos et al., "Complex Band Structure and Tunneling through Ferromagnet/Insulator/Ferromagnet Junctions", Phys. Review Letters, Vol. 85, No. 5, July 31, 2000, pp. 1088-1091.	
		D. J. Monsma et al., "Spin polarization of tunneling current from ferromagnet/A12O3 Interfaces using copper-doped aluminum superconducting films", Applied Physics Letters, Vol. 77, No. 5, July 31, 2000, pp. 720-722.	

Examiner Signature	Date Considered
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*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

¹ Applicant's unique citation designation number (optional). ² Applicant is to place a check mark here if English language Translation is attached.

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Substitute for form 1449B/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT (use as many sheets as necessary)				Application Number	10/646,247
				Filing Date	August 22, 2003
				First Named Inventor	S. Parkin
				Group Art Unit	2811
				Examiner Name	Unassigned
Sheet	4	of	5	Attorney Docket Number	ARC920030071US1

OTHER PRIOR ART -- NON PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No. ¹	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published	T ²
		X.-F. Han et al., "Fabrication of high-magnetoresistance tunnel junctions using Co75Fe25 ferromagnetic electrodes", Applied Physics Letters, Vol. 77, No. 2, July 10, 2000, pp 283-285.	
		H. Xi, "Annealing Effect on Exchange Bias in Ni81Fe19/Cr50Mn50 Bilayers", IEEE Transactions on Magnetics, Vol. 36, No. 5, September 2000, pp. 2644-2646.	
		S. Cardoso et al., "High thermal stability tunnel junctions", Journal of Applied Physics, Vol. 87, No. 9, May 1, 2000, pp. 6058-6060.	
		S. Cardoso et al., "Spin-tunnel-junction thermal stability and interface interdiffusion above 300 C", Applied Physics Letters, Vol. 76, No. 5, January 31, 2000, pp. 610-612.	
		M. Takiguchi et al., "Thermal degradation of spin valve multilayers caused by Mn Migration", Journal of Applied Physics, Vol. 87, No. 5, March 1, 2000, pp. 2469-2471.	
		H.L. Meyerheim et al., "Geometrical and Compositional Structure at Metal-Oxide Interfaces: MgO on Fe(001)", Physical Review Letters, Vol. 87, No. 7, August 13, 2001, pp. 076102-1 through 076102-4.	
		M. Bowen et al., "Large magnetoresistance in Fe/MgO/FeCo(001) epitaxial tunnel junctions on GaAs(001)", Applied Physics Letters, Vol. 79, No. 11, Sept. 10, 2001, pp. 1655-1657.	
		W. Wulfschlag et al., "Single-crystal magnetotunnel junctions", Applied Physics Letters, Vol. 78, No. 4, Jan. 22, 2001, pp. 509-511.	
		W. H. Butler et al., "Spin-dependent tunneling conductance of Fe/MgO/Fe sandwiches", Physical Review B, Vol. 63, Jan. 8, 2001, pp. 054416-1 through 054416-12.	
		Y. Kim et al., "Magnetoresistance and interlayer diffusion in PtMn spin valves upon postdeposition annealing", J. of Applied Physics, Vol. 89, No. 11, June 1, 2001, pp. 6907-6909.	
		S. Yuasa et al., "Spin-Polarized Resonant Tunneling in Magnetic Tunnel Junctions", Science, Vol. 297, July 12, 2002, pp. 234-237.	

Examiner Signature		Date Considered	
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¹ Applicant's unique citation designation number (optional). ² Applicant is to place a check mark here if English language Translation is attached.

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (use as many sheets as necessary)				Application Number	10/646247
				Filing Date	August 22, 2003
				First Named Inventor	S. Parkin
				Group Art Unit	2811
				Examiner Name	Unassigned
Sheet	5	of	5	Attorney Docket Number	ARC920030071US1

OTHER PRIOR ART – NON PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No. ¹	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T ²
		E. Popova et al., "Epitaxial MgO layer for low-resistance and coupling-free magnetic tunnel junctions", Applied Physics Letters, Vol. 81, No. 6, August 5, 2002, pp. 1035-1037.	
		M. Tsunoda et al., "60% magnetoresistance at room temperature in Co-Fe/Al-O/Co-Fe tunnel junctions oxidized with Kr-O ₂ plasma", Appl. Phys. Letters, Vol. 80, No. 17, April 29, 2002, pp. 3135-3137.	
		X.-G. Zhang et al., "Effects of the iron-oxide layer in Fe-FeO-MgO-Fe tunneling junctions", Physical Review B, Vol. 68, 2003, pp. 092402-1 through 092402-4.	
		S. Mitani et al., "Fe/MgO/FeCo(100) epitaxial magnetic tunnel junctions prepared by using in situ plasma oxidation", Journal of Applied Physics, Vol. 93, No. 10, May 15, 2003, pp. 8041-8043.	
		J. Faure-Vincent et al., "High tunnel magnetoresistance in epitaxial Fe/MgO/Fe tunnel junctions", Applied Physics Letters, Vol. 82, No. 25, June 23, 2003, pp. 4507-4509.	
		M. Zwierzycki et al., "Spin injection through an Fe/InAs interface", Physical Review B, Vol. 67, 2003, pp. 092401-1 through 092401-4.	
		D. Smith et al., "Structural characterization of thin film ferromagnetic tunnel junctions", Journal of Applied Physics, Vol. 83, No. 10, May 15, 1998, pp. 5154-5158.	
		J. Mathon et al., "Theory of tunneling magnetoresistance of an epitaxial Fe/MgO/Fe (001) junction", Physical Review B, Vol. 63, pp. 220403-1 through 220403-4.	
		M. Klaua et al., "Growth, structure, electronic, and magnetic properties of MgO/Fe(001) bilayers and Fe/MgO/Fe(001) trilayers", Physical Review B, Vol. 64, pp. 134411-1 through 134411-8.	

Examiner Signature		Date Considered	
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